

### **Lunar Roadmap Alternatives**



- Presenting 4 roadmap alternatives for committee to consider
  - Evolution Emphasis
  - Early Outpost
  - Expedited Moon-to-Mars
  - Commercial Emphasis

#### Exercise for committee

- Review and edit presented set of roadmap alternatives
- Eliminate from or add to set of roadmap alternatives

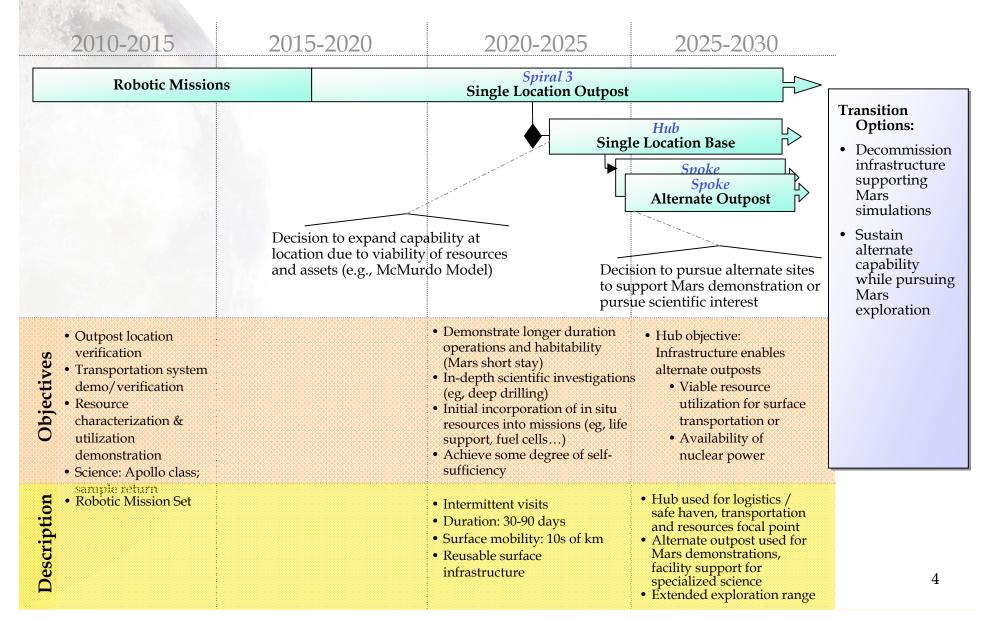
# **Option A: Evolution Emphasis**



2010-2015	2015-2020		2020-2025	2025-2030		
			<ul> <li>Decision to emplace far side astronomy instruments</li> <li>Other high value science or security interests at alternate sites</li> </ul>		Transition Options: • Decommission	
Robotic Missions		Spiral 2 Fortie Missions	Single Location	Outpost	the base and focus on Mars exploration	
		<ul> <li>High science value site (discovery)</li> <li>High concentration resource site located</li> <li>Mars date imperative</li> <li>Political Imperative</li> <li>Security Imperative</li> <li>Decision to perform Long</li> <li>full-up Mars simulation</li> </ul>				
Objectives	<ul> <li>Outpost location verification</li> <li>Transportation system demonstration/verification</li> <li>Resource characterization &amp; utilization demonstration</li> <li>Science: Apollo class; sample return</li> <li>Potential global access</li> <li>Duration: 4-14 days</li> <li>Surface mobility: up to 10 km</li> <li>Expendable surface infrastructure</li> </ul>		<ul> <li>Demonstrate longer duration operations and habitability (Mars short stay)</li> <li>In-depth scientific investigations (eg: deep drilling)</li> <li>Initial incorporation of in situ resources into missions (eg: life support, fuel cells)</li> <li>Achieve some degree of self-sufficiency</li> </ul>	<ul> <li>Demonstrate long Mars stay surface mission</li> <li>Systems verification exercise</li> <li>at appropriate appropriate</li></ul>	support science and security	
Description			<ul> <li>Intermittent visits</li> <li>Duration: 30-90 days</li> <li>Surface mobility: 10s of km</li> <li>Reusable surface infrastructure</li> </ul>	<ul> <li>Up to two visits</li> <li>Duration: 365 days or greater</li> <li>Surface mobility: 10s of km</li> <li>Reusable surface infrastructure</li> </ul>	3	

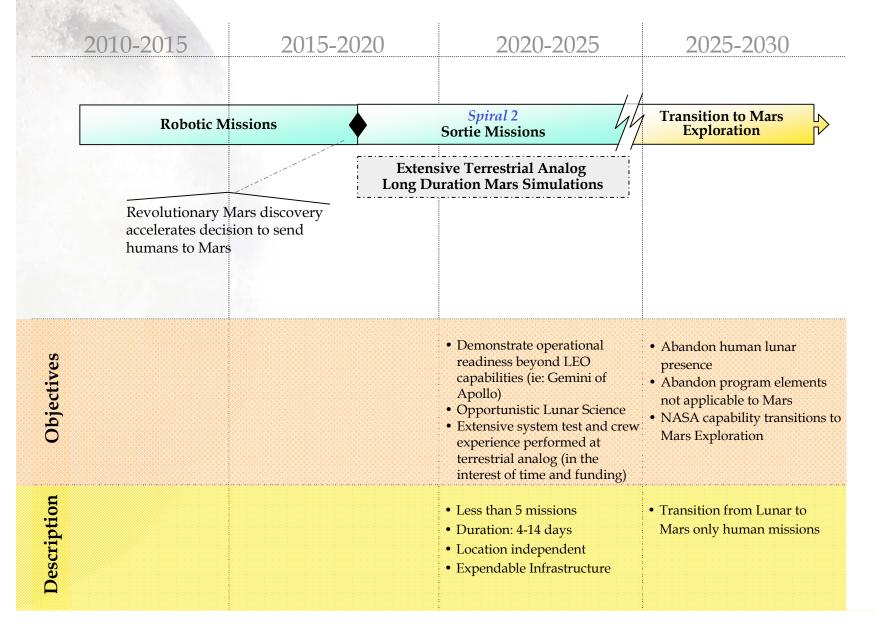
# **Option B: Early Outpost**





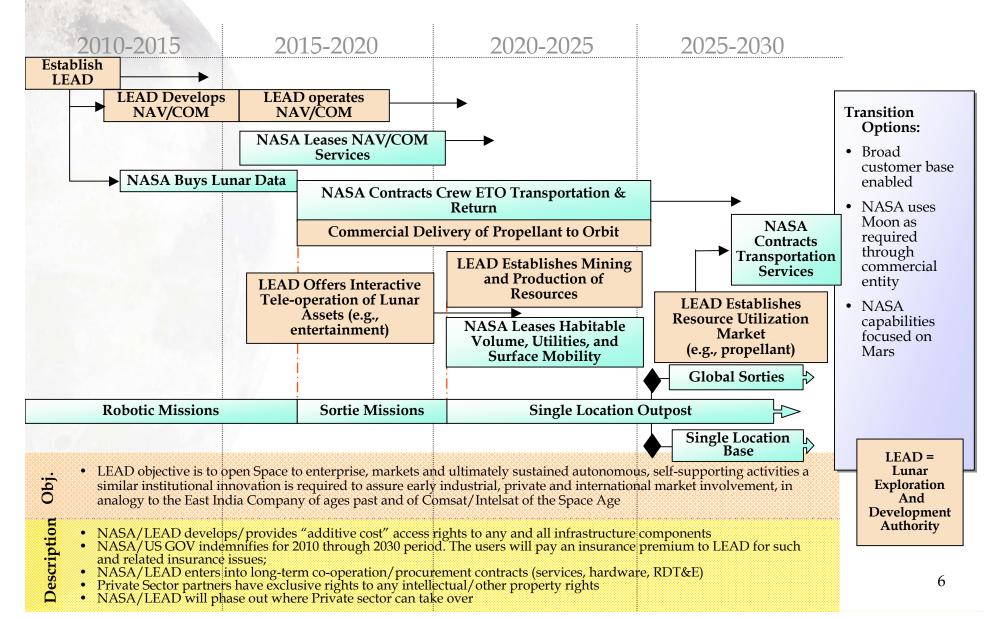
### **Option C: Expedited Moon-to-Mars**





## **Option D: Commercial Emphasis**





### **Key Questions**



### **Transition Strategy**

- How should NASA transition from a lunar focus to a Mars focus once lunar objectives are achieved?
- How do we build in a transition strategy from the beginning, particularly for commercial interests?

#### "Sustained"

- What is the definition of "Sustained" exploration as applied to the Moon (e.g., Moon to stay or Moon as a stepping stone)?
- Is "Sustained" an objective for returning to the Moon or a Figure of Merit?

#### Other

- How long a stay on the lunar surface is required to demonstrate Mars adaptation and operations (assumes long duration on Mars)?
- How should terrestrial analogs be used in conjunction with lunar activities?
- What is the best approach for international collaboration?